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## Notes on the flora of Iran 5: *Halimocnemis longifolia* (Chenopodiaceae) a new record from Iran<sup>1</sup>

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**A b s t r a c t :** *Halimocnemis longifolia* BUNGE is reported as a new record for East and North-Central Iran from two localities in Khorassan and Semnan provinces. The habitat, pollen morphology and illustration of the species and its phytogeographical importance are given. A key to identification of four accepted species of *Halimocnemis* in Iran is provided together with their illustration.

**K e y w o r d s :** Flora of Iran, Chenopodiaceae, *Halimocnemis*, sand dunes, Aralo-Caspian Province.

### Introduction

With its characteristic vesicular anther appendages the genus *Halimocnemis* (besides *Halanthium*, *Gamanthus*, *Halocharis*, *Climacoptera* and *Physandra*) belongs to a problematic group of genera in tribe Salsoleae (Chenopodiaceae). *Halimocnemis* consists of c. 15 species distributed in the central Asian countries including Iran. They are usually xerohalophytic species with succulent and usually terete or semi-terete leaves. The genus is closely related to *Halanthium* from which it is distinguished by the absence of wings in the fruiting perianths. However, according to our studies, the importance of such wings as a generic character needs to be reconsidered.

HEDGE (1997) mentioned the occurrence of five species of *Halimocnemis* within the borders of the Flora Iranica area, three of which are reported from Iran. AKHANI (1996) discussed the nomenclatural and taxonomical ambiguity of *Halimocnemis purpurea*, the generic status of which was obscure. Based on our recent studies, it was shown that the fruiting perianths of this species are winged and, therefore, its position in *Halanthium* should be reconsidered. In a recent treatment of the Flora of Iran in Persian, ASSADI (2001) accepted the genus *Physogeton* JAUB. & SPACH Illustr. Pl. Or. 2: tab. 13 (1844) and separated the latter species from *Halimocnemis* based on the woody fruiting perianths which fall together with associated bracteoles. Accordingly, he mentioned the occurrence of three species of *Physogeton* (*Ph. occultus* (BUNGE) ASSADI, *Ph. acanthophyllus* JAUB. & SPACH and *Ph. pedunculatus* (ASSADI) ASSADI) and four species of *Halimocnemis* (*H. azarbaijanensis* ASSADI, *H. mamamensis* (BUNGE) ASSADI, *H. pilifera* MOQ. and *H. mollissima* BUNGE).

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<sup>1</sup> Followed from AKHANI 2003

Based on our current taxonomic revision of this complex we found the need for a critical revision of the complex, which will be dealt with in another publication. During this work we encountered one specimen from Semnan Province which was identified as *H. longifolia*. Later, the same species was found in another location in Khorassan (Fig. 1). In this paper its description, habitat, illustration and pollen morphological features are provided together with a key to identification of four accepted *Halimocnemis* species in Iran.

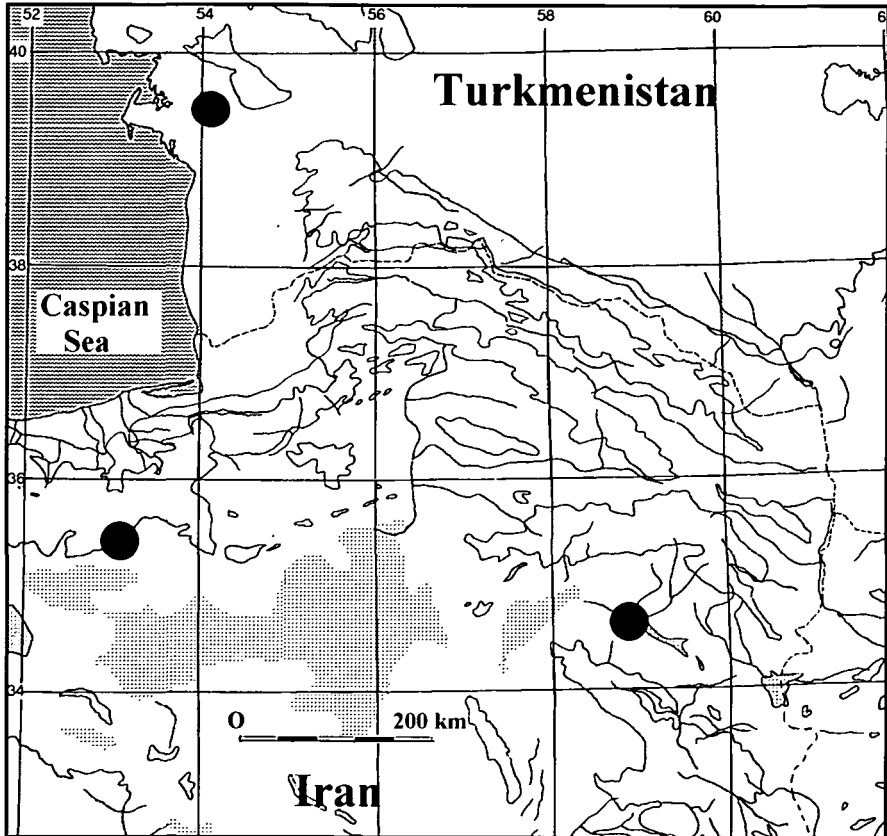


Fig. 1: Distribution map of *Halimocnemis longifolia* in Iran and one additional locality in Turkmenistan.

#### *Halimocnemis longifolia* BUNGE new to Iran

*Halimocnemis longifolia* BUNGE in Trudy Glavn. Bot. Sada. 5: 643 (1877). Fig. 2A-B.

Annual plant, erect, 8-32 cm tall, branched at some distance (one-third) above the base, branches short and rather intricate giving a bush-like habit, grayish green. Indumentum of short patent hairs and spreading long articulated hairs mainly in the lower part of leaves and bracts, long hairs up to 5 mm. Leaves succulent, terete, 13-30 × 2-3.5 mm, terminating in a short mucro 2-3 mm long. Bracts similar to leaves, longer than the flow-

ers, extended at the base, 10-25 × 2.5 mm, terminating in a short mucro. Bracteoles 2, 9-12 mm long, strongly keeled on lower back. Bracts and bracteoles not covering perianth segments. Flowers ± circular at cross section; perianth segments 4-5, acute, 6.5-9 mm, unequal in width, connate at 1/3 to 1/2 of the lower length, in fruiting time indurated and woody in 2/3 of length, membranaceous in upper free parts, without outgrowth on the back, glabrous in 1/3 of lower length, sparsely hairy in the middle to densely sericeous in uppermost length. Disseminules with inconspicuous with 4-5 pits around the abscission zone in ± semicircular basal view. Stamens 5, filaments 3.5 mm long; anthers divided for 1/3 of length, 2 mm long, anther appendage pale yellow, oblong, acute, 1.3 × 0.7 mm. Styles 2-3 mm; stigma bifid, sometimes inconspicuously 4-fid, linear, crenate at tips, 0.5-1 mm. Fruits globose, 2.5 × 2.5 mm.

**S p e c i m e n s e x a m i n e d :** IRAN: Khorassan: 30 km N Gonabad towards Torbat-e Heydarieh, saline-sandy soils, 34°38'44"N, 58°45'38"E, 871m, 31.8.2003, H. Akhane & M. R. Joharchi, 17245 (IRAN, FMUH, Hb. Akh.). Semnan: ca. 32 km W Semnan, near Lasjerd, 35°22'N, 53°07'E, 27.10.1987, Akhane 4031 (Hb. Akh.). TURKMENISTAN: Balkan Province (= Krasnovodskaya oblasti) : c. 17 km NW of Nebet-Dagh, Jebel, Research Station of Desert Institute, c. 0 m, 9.9.1994, Akhane 10079-T (Hb. Akh.).

*H. longifolia* was erroneously reported from Iran by WENDELBO (in RECHINGER 1977) from Touran Protected Area based on the wrong identification of *H. occulta* (see also HEDGE 1997). Therefore, it is correctly reported here for the first time from Iran. As it is found in the East and NW of Iranian Dasht-e Kavir, finding of additional localities can be expected in the future.

The habitat of *H. longifolia* as a halo-psammophytic species in Khorassan are shallow sandy dunes, which are developed on salty soils. Associated species are: *Salsola arbuscula* PALL., *Haloxylon persicum* BUNGE ex BOISS. & BUHSE, *Agriophyllum latifolium* FISCH. & C.A. MEY., *A. minus* FISCH. & C.A. MEY., *Calligonum* sp., *Salsola paulsenii* LITW., *Euphorbia cheirolepis* FISCH. & C.A. MEY. and *Tetracme recurvata* BUNGE.

*Halimocnemis longifolia* is a characteristic species having strongly indurated and woody fruiting perianths, which are connate in 1/3 to 1/2 of the lower length and not completely covered by bracts and bracteoles. The connate fruiting perianths are also important features in *H. occulta* (Fig. 2F), an endemic species known from a few localities in the eastern parts of Iran. However, in this latter species the perianths are completely covered by bracteoles. Furthermore, it has an ascending-prostrate habit and grows on much drier gypsum-salty soils.

*Halimocnemis longifolia* is a typical Aralo-Caspian species known from different localities in the Central Asian deserts including Turkmenistan, Uzbekistan, Songaria (Balkhash, Kyzyl Kum, Syr Darya, Kara Kum) (ILJIN 1936). The occurrence of this species in Iran increases the list of Aralo-Caspian species in Central Iranian deserts. ZOHARY (1973) considered them as enclaves of the Central Asian flora in Iran. LÉONARD (1989) and RECHINGER (1977) stressed stronger floristic connections between Iranian deserts and the Aralo-Caspian area. Here a list of such links characterizing halophytic and psammophytic flora is provided:

*Agriophyllum latifolium* FISCH. & C. A. MEY.  
ex FENZL

*Agriophyllum minus* FISCH. & C. A. MEY.

*Arguzia sogdiana* (BUNGE) CZER.

*Calligonum turkestanicum* (KOROV.) PAVLOV

*Climacoptera turcomanica* (LITW.) BOTSCH.

*Cousinia turkmenorum* BORNH.

*Euphorbia cheirolepis* FISCH. & C. A. MEY.

*Halimocnemis longifolia* BUNGE

*Haloxylon ammodendron* (C. A. MEY.)  
BUNGE ex FENZL

*Heliotropium dasycarpum* LEDEB. subsp.  
*dasycarpum*

*Heliotropium dasycarpum* subsp.  
*transoxanum* (BUNGE) AKHANI &  
FÖRTHNER

*Heliotropium micranthum* (PALL.) BUNGE

*Horaninowia ulicina* FISCH. & C. A. MEY.

*Launaea korovinii* (M. POP.) M. POP. ex  
PAVL.

*Piptoptera turkestanica* BUNGE

*Salsola aperta* PAULSEN

*Salsola arbuscula* PALL.

*Salsola arbusculiformis* DROB.

*Salsola paulsenii* LITW.

*Salsola praecox* LITW.

*Salsola richteri* (MOQ.) KAREL. ex LITW.

*Schumannia karelinii* (BUNGE) KOROV.

*Smirnowia turkestanica* BUNGE

*Stipagrostis karelinii* (TRIN. & RUPR.)  
TZVELEV

*Stipagrostis pennata* (TRIN.) DE WINTER

*Suaeda linifolia* PALL.

*Suaeda physophora* PALL.

*Tetracme recurvata* BUNGE

**Pollen morphology:** The pollen morphology of *H. longifolia* has been studied together with many other species in tribes Salsoleae, Suaedeae and Salicornieae using the classical acetolysis method (see details of method in AKHANI et al. 2003). In Tab. 1 the important morphometric pollen grains of *H. longifolia*, *H. mollissima*, *H. occulta* and *H. pilifera* are given. All pollen grains are monad and radially symmetrical, isopolar, pantopolyporate, prolate spheroidal as in many other species of Chenopodiaceae. As it is shown, *H. longifolia* has the lowest number of pores among all studied *Halimocnemis* species. Regarding to other pollen characters, it looks more similar to *H. mollissima* rather than to others. *H. occulta*, with its highest number of pores and highest diameter evidently deviates from all studied species of *Halimocnemis* and *Halanthium* in Iran.

**Tab. 1:** Comparison of morphometric measurements of pollen grains in four species of *Halimocnemis*. Figures are means of 100 measurements and their standard deviations. Vouchers: *H. longifolia* (Akhani 10079T), *H. occulta* (Faghiniha & Zangoei 21.10.1991), *H. pilifera* (Akhani & Ghobadnejhad 15276), *H. mollissima* (Akhani, Ghobadnejhad & Zarrinpur 15063).

Species	Pollen diameter $\mu\text{m}$	Pore diameter $\mu\text{m}$	Operculum diameter $\mu\text{m}$	Chord distance $\mu\text{m}$ *	Chord/Diameter ratio $\mu\text{m}$	Pore number $\mu\text{m}$	Exine thickness $\mu\text{m}$
<i>H. longifolia</i>	30.53 $\pm 1.04$	5.07 $\pm 0.54$	6.73 $\pm 0.56$	11.88 $\pm 0.10$	0.3855 $\pm 0.0305$	23 $\pm 4$	2.41 $\pm 0.42$
<i>H. mollissima</i>	30.70 $\pm 1.10$	8.25 $\pm 0.75$	6.48 $\pm 0.69$	11.51 $\pm 0.97$	0.3748 $\pm 0.0288$	25 $\pm 4$	2.76 $\pm 0.38$
<i>H. pilifera</i>	25.00 $\pm 1.02$	5.58 $\pm 0.47$	4.30 $\pm 0.45$	9.38 $\pm 0.67$	0.3659 $\pm 0.0270$	26 $\pm 4$	1.76 $\pm 0.25$
<i>H. occulta</i>	37.14 $\pm 1.92$	4.93 $\pm 0.56$	6.36 $\pm 0.80$	11.37 $\pm 0.81$	0.3070 $\pm 0.0239$	37 $\pm 6$	3.01 $\pm 0.27$

\* distance between two adjacent pores

**Photosynthetic pathway:** *H. longifolia* is a  $C_4$  plant with  $\delta^{13}\text{C}$  of  $-13.95\text{‰}$  according to a sample from Turkmenistan (AKHANI et al. 1997).

**Key to the species of *Halimocnemis* in Iran**

- 1 Fruiting perianth segments connate in lower parts ..... 2
- Fruiting perianth segments free to base ..... 3
- 2 Plant prostrate and ascending, up to 15 cm tall; perianths completely covered by bracteoles, all adnate and reddish in lower parts; fruiting perianths with minute outgrowth; plant grows mostly on dry gypsum hills.....*H. occulta* (Fig. 2F)
- Plant erect, up to 30 cm tall, fruiting perianths distinct from bracteoles, not covered by them; perianth segments without outgrowth on back .....*H. longifolia* (Fig. 2A, B)
- 3 Leaves 2-6.5 cm, anther appendage oblong, yellow, acute at apex, stigma truncate.....*H. mollissima* (Fig. 2C, D)
- Leaves 1-2.3 cm, anther appendage orbicular, purplish to whitish, stigma subulate .....*H. pilifera* (Fig. 2E)

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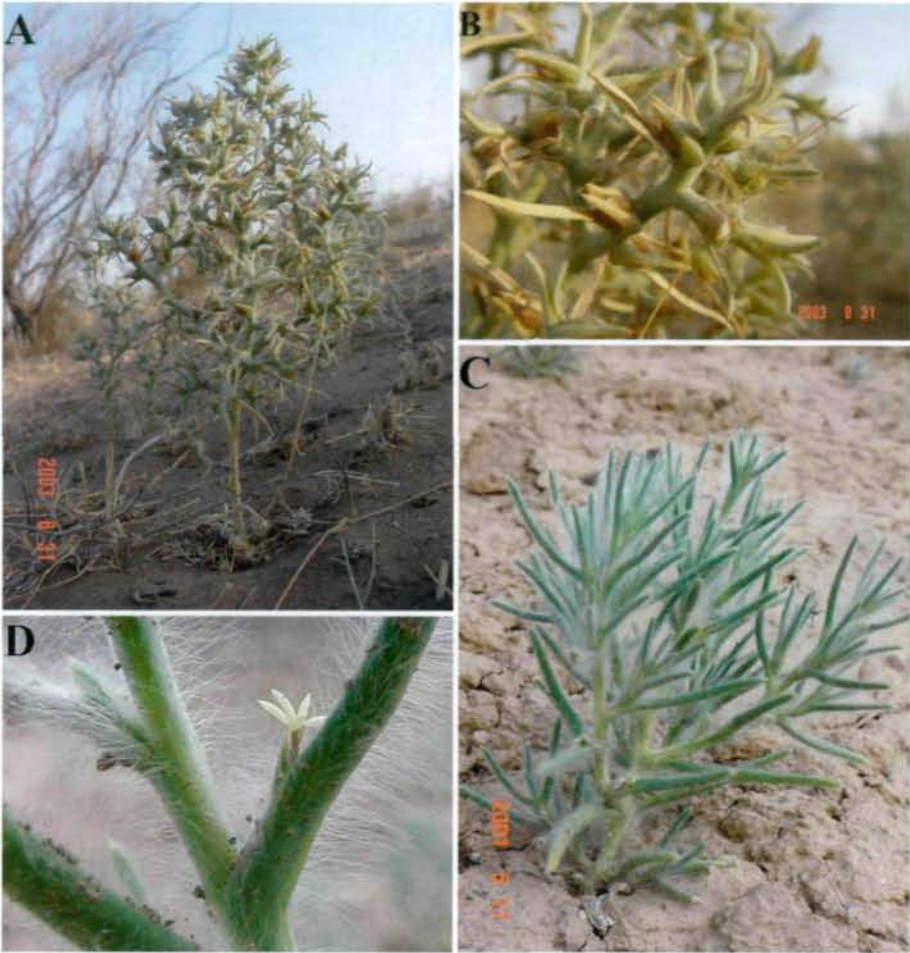
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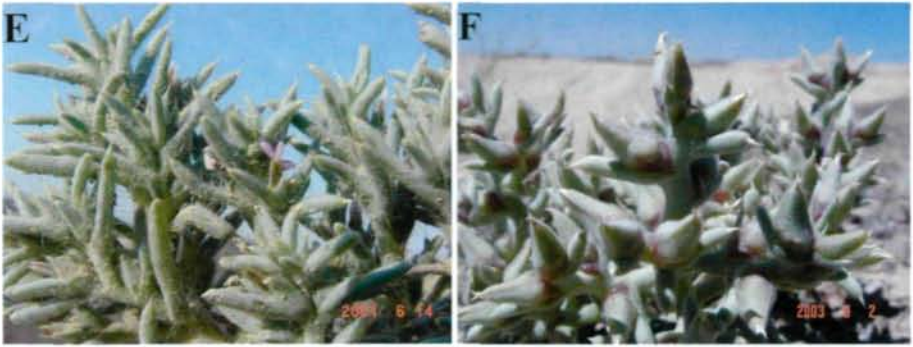
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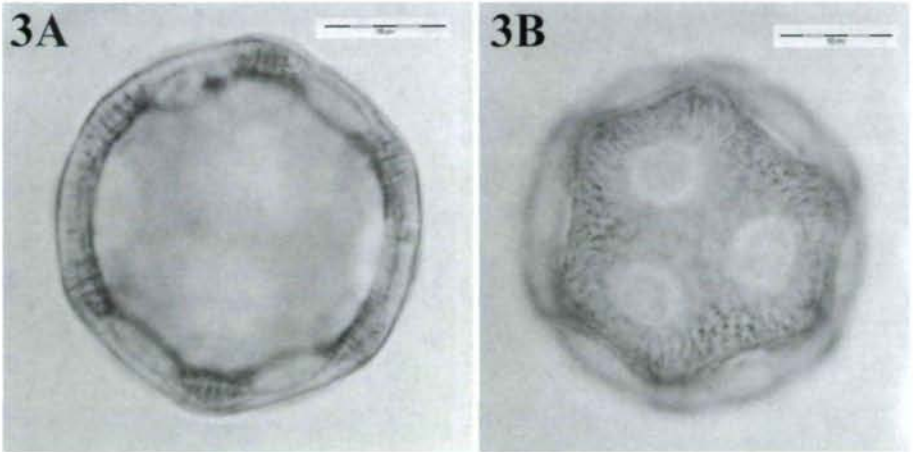
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**Fig. 2:** *Halimocnemis* species in Iran. **A-B:** *H. longifolia*, **C-D:** *H. mollissima*, **E:** *H. pilifera*, **F:** *H. occulta*. All pictures from H. Akhani.



**Fig. 3:** Light microscope images of pollen grains of *Halimocnemis longifolia*. Scale bar 10  $\mu\text{m}$ .



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